

~~GOVERNMENT USE ONLY~~

STAT

THE EFFECT OF A SUPERHIGH-FREQUENCY ELECTROMAGNETIC FIELD ON THE MEMBRANE
POTENTIAL OF SMOOTH MUSCLE CELLS OF THE RAT STOMACH FUNDUS

pp 3-4

[Abstract of article by P. G. Bogach, V. I. Mirumiko, and I. L. Dolgiy,
Department of Biophysics, Kiev State University imeni T. G. Shevchenko,
Kiev]

[Text] This study concerned the effect of a superhigh-frequency electromag-
netic field 5, 10, 15, and 20 minutes in duration on the membrane potential
(MP) of smooth muscle cells of the rat stomach fundus in circulating Krebs'
solution at 37°C, as well as the behavior of the MP for 6 hours after the
field was turned off.

A GZ-30B generator operating in the sawtooth modulation mode at an integral
power of 1 mw was used as the microwave energy source (wavelength 8 mm).
Smooth muscle cells were irradiated in a special humidified chamber and
then placed in a measuring chamber with circulating solution at the indi-
cated temperature. It was demonstrated that the smooth muscle cell MP mag-
nitude did not change significantly during 6 hours. Therefore the MP re-
corded throughout this time is the most suitable MP value from a physiolo-
gical point of view.

It was established by microelectrode techniques that the size of the MP of
smooth muscle cells in the rat stomach fundus was 35.0 ± 1.5 mv. In response
to the superhigh-frequency electromagnetic field the MP magnitude decreased
in direct proportion to the quantity of field energy absorbed. The behavior
of the smooth muscle MP after the superhigh-frequency field is turned off
has its own typical features and depends on the duration of the exposure.

Thus in the second hour after a 5-minute exposure to the superhigh-frequency
field the MP returns to its initial value. By the fourth hour it decreases
to the value recorded immediately after the field is turned off. In the fifth
hour it increases to 25 mv, and then it gradually drops.

Two hours after a 10-minute exposure the MP recovers as well, but not to its
initial value. It only reaches 26.0 ± 0.9 mv. Then it reaches a minimum

1

~~GOVERNMENT USE ONLY~~

SPRS-19

GOVERNMENT USE ONLY

(at 3 hours), and in the fifth hour it reaches the initial value. Subsequently it drops rapidly.

The reduction in MP value is more significant after 15- and 20-minute exposures to the superhigh-frequency field than after 10- and 5-minute exposures. The time of partial MP recovery increased somewhat.

When smooth muscle cells were in sodium-deficient Krebs' solution (sodium was substituted by sucrose) a 5-minute exposure to the superhigh-frequency field caused a reduction in the MP to a value 50 percent of the initial value. The MP has only one recovery maximum (at the second hour) after the superhigh-frequency field exposure is terminated. These results indicate that sodium participates in mechanisms causing reduction of MP during superhigh-frequency field exposure and after its termination. The possible mechanisms underlying interaction between a superhigh-frequency electromagnetic field and living cells are discussed.

11004

CSO: 8344/1569A

GOVERNMENT USE ONLY